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COMPETITION BETWEEN NONCONTINGENT AND CONTINGENT REINFORCEMENT SCHEDULES DURING RESPONSE ACQUISITION

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We examined the extent to which noncontingent reinforcement (NCR), when used as treatment to reduce problem behavior, might interfere with differential reinforcement contingencies designed to strengthen alternative behavior. After conducting a functional analysis to identify the reinforcers maintaining 2 participants' self-injurious behavior (SIB), we delivered those reinforcers under dense NCR schedules. We delivered the same reinforcers concurrently under differential-reinforcement-of-alternative-behavior (DRA) contingencies in an attempt to strengthen replacement behaviors (mands). Results showed that the NCR plus DRA intervention was associated with a decrease in SIB but little or no increase in appropriate mands. In a subsequent phase, when the NCR schedule was thinned while the DRA schedule remained unchanged, SIB remained low and mands increased. These results suggest that dense NCR schedules may alter establishing operations that result in not only suppression of problem behavior but also interference with the acquisition of appropriate behavior. Thus, the strengthening of socially appropriate behaviors as replacements for problem behavior during NCR interventions might best be achieved if the NCR schedule is first thinned.

DESCRIPTORS: functional analysis, noncontingent reinforcement, differential reinforcement of alternative behavior, functional communication training, self-injurious behavior, satiation

Noncontingent reinforcement (NCR), which is defined as delivery of a reinforcer according to a schedule that is not response contingent (Rescorla & Skucy, 1969), was originally designed as an experimental control technique but has emerged in the applied literature as an effective treatment for severe behavior disorders (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Recent studies on NCR include parametric variations (J. E. Carr et al., 1998; Hagopian, Fisher, & Legacy, 1994), procedural variations based on the function of the target behaviors (Fischer, Iwata, & Mazaleski, 1997; Hanley, Piazza, & Fisher, 1997; Lalli, Casey, & Kates, 1997; Vollmer, Marcus, & Ringdahl, 1995), and comparative analyses (Mace & Lalli, 1991; Roscoe, Iwata, & Goh, 1998; Vollmer et al., 1993). In addition, two studies have focused on potential problems that might arise during the course of implementing NCR interventions: (a) adventitious reinforcement of problem behavior as a side effect of NCR (Vollmer, Ringdahl, Roane, & Marcus, 1997), and (b) satiation effects associated with NCR that may interfere with the acquisition of other behaviors (Marcus & Vollmer, 1996). The present study examines the latter problem through an extension of the work of Marcus and Vollmer.

Marcus and Vollmer (1996) noted that one mechanism that may account for response suppression during NCR is satiation to the reinforcer being delivered. If so, similar effects might be observed if the same reinforcer was used in an attempt to strengthen an alternative behavior. This

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problem could be encountered when using any differential reinforcement procedure (e.g., differential reinforcement of other behavior [DRO] or differential reinforcement of alternative behavior [DRA]), but is especially pertinent when implementing functional communication training, a variation of DRA in which the same reinforcer that maintains problem behavior is delivered following the occurrence of an alternative response (E. G. Carr & Durand, 1985). Under certain conditions, then, NCR may compromise the effects of differential reinforcement contingencies.

After conducting a functional analysis to identify the reinforcers that maintained 3 participants' problem behavior, Marcus and Vollmer (1996) implemented several variations of NCR and DRA, two of which are relevant to the present research. One participant (Sally) was initially exposed to a combined treatment consisting of NCR and DRA in which the same reinforcer was delivered noncontingently (NCR) *and* contingent on each occurrence of an alternative response (DRA). During this condition (a) target behaviors were placed on extinction; (b) NCR initially was delivered according to a fixed-time (FT) 20-s schedule, which approximated the rate of reinforcement during baseline and amounted to continuous reinforcement because reinforcer (leisure item) access time was also 20 s, but was rapidly thinned to an FT 3-min schedule within the same phase; and (c) independent occurrences of the alternative response (mands) were reinforced on an fixed-ratio (FR) 1 schedule. Sally's data showed that her problem behavior decreased while her mands increased, and these results were replicated when the same procedures were reimplemented following a reversal phase. The 2nd participant (Rob) experienced a slightly different arrangement. He was first exposed to two conditions (initial treatment and again following a reversal) in which NCR was implemented alone and was thinned from FT 20 s to FT 1 min (first treatment) and from FT 20 s to FT 30 s (second treatment). Following the second NCR condition, NCR remained in effect and was thinned from FT 1 min to FT 5 min while DRA was implemented in a manner similar to that used for Sally (FR 1 schedule). Rob's data showed decreases in problem behavior during the two NCR conditions. During the NCR plus DRA condition, Rob's problem behavior initially showed some variability but eventually decreased to zero, while his mands eventually occurred at rates higher than those observed for problem behavior.

The results obtained for Sally and Rob in the Marcus and Vollmer (1996) study indicated that the effects of NCR produced little, if any, interference with those of DRA. That is, both participants acquired mand responses during the NCR plus DRA condition. However, it is important to note that Sally's NCR schedule was thinned rapidly, and that increases in her mands appeared to be correlated with decreases in the rate of NCR deliveries. During both of her NCR plus DRA conditions, no mands occurred during sessions in which the NCR schedule (FT 20 s, or three reinforcers per minute) approximated the rate of reinforcement available for problem behavior during baseline; manding increased only when the NCR schedule was thinned. Rob was exposed to NCR plus DRA only after the NCR schedule had already been thinned (FT 20 s to FT 1 min); still, his rate of manding did not consistently exceed his rate of problem behavior until the NCR schedule was thinned to FT 2 min. Thus, it is possible that the initial dense schedules of NCR prescribed for both participants interfered with their acquisition of alternative behavior, but that these effects were attenuated quickly due to the fact that the NCR schedules were thinned from the outset of DRA (Sally) or before DRA was implemented (Rob). We re-

examined the possibility that NCR effects may compromise DRA effects by implementing concurrent schedules of NCR and DRA. The initial dense NCR schedules were kept constant for a number of sessions to determine their influence, as well as that of NCR schedule thinning, on response acquisition under DRA.

GENERAL METHOD

Participants, Setting, and Materials

Two individuals participated. Both lived in a state residential facility for persons with developmental disabilities and had been referred to a day-treatment program for assessment and treatment of their self-injurious behavior (SIB). Lisa, a 28-year-old woman, had been diagnosed with profound mental retardation. She responded to a few simple requests but had no expressive language. Julia, a 43-year-old woman, had also been diagnosed with profound mental retardation and was moderately myopic. She complied with a few simple requests but had no expressive language. She also received Dilantin® to treat seizures throughout the study.

All sessions were conducted in therapy rooms at the day-treatment program located on the grounds of the residential facility, which contained a table, chairs, and materials relevant to various conditions in the study (see below). Sessions lasted for 15 min and were conducted two to four times daily, 4 to 5 days per week.

Experimental Sequence

A functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) was first conducted to identify contingencies that maintained the participants' SIB. Subsequently, participants were exposed concurrently to an NCR intervention, in which the reinforcers that maintained SIB were delivered according to time-based schedules, and to a DRA intervention, in which the same reinforcers were delivered contingent on the occurrence of alternative behaviors (mands).

Response Measurement and Interobserver Agreement

The dependent variables were SIB and appropriate mands. SIB was defined as slapping any part of the body or biting the fingers (Lisa), and pinching, scratching, or digging (with fingers) any part of the body (Julia). Mands (alternative responses to SIB) were defined as unprompted occurrences of clapping the hands (Lisa) and waving a hand from side to side (Julia).

Data were collected on the frequency of SIB and mands by trained observers using handheld computers (Assistant, Model AST-102). Data also were collected on the frequency of therapists' prompts and reinforcer deliveries as a means of monitoring procedural fidelity; these measures always exceeded 90% accuracy. Interobserver agreement was assessed by having an independent observer collect data with the primary observer during 41.9% of Lisa's sessions and 31.5% of Julia's sessions. Observers' records were compared by first dividing session time into continuous 10-s intervals. Agreement percentages were calculated by dividing the smaller number of responses recorded in each interval by the larger number of responses; these fractions were averaged across the session and then multiplied by 100%. Mean agreement percentages were, for SIB, 94.5% (range, 89.0% to 100%) for Lisa and 97.7% (range, 89.7% to 100%) for Julia; for mands, 97.3% (range, 88.0% to 100%) for Lisa and 98.5% (range, 94.1% to 100%) for Julia.

PHASE 1: FUNCTIONAL ANALYSIS

Method

Both participants were exposed to a series of assessment conditions based on proce-

dures described by Iwata et al. (1982/1994), which were arranged in multielement designs. The purpose of this assessment was to identify the maintaining reinforcers for participants' SIB, which would then be delivered during the treatment phase of the study.

Assessment Conditions

Attention. This condition provided a test for sensitivity to positive reinforcement (attention) as a source of maintenance for SIB. The therapist and participant were in a room containing a variety of leisure materials, to which the participant had free access throughout the session. The therapist ignored the participant throughout the session, except to deliver statements of concern and disapproval (e.g., "Stop, don't do that; you'll hurt yourself") contingent on each occurrence of SIB.

Tangible. Lisa's staff reported that she frequently engaged in SIB in the presence of food; therefore, she was exposed to a variation of the attention condition. Results of a preference assessment (DeLeon & Iwata, 1996) indicated that Lisa's most highly preferred food was pickles. The tangible condition was similar to the attention condition with the following exception. Prior to the start of a session, the therapist allowed Lisa free access to sliced pickles for a period of 30 s. When the session began, the therapist ignored Lisa except to deliver a small piece of sliced pickle (about one fourth of a slice) following each occurrence of SIB.

Demand. This condition provided a test for sensitivity to negative reinforcement (escape from demands) as a source of maintenance for SIB. The therapist presented learning trials to the participant using a three-prompt sequence (instruction, demonstration, physical prompt) on an FT 30-s schedule. The therapist delivered praise contingent on the occurrence of compliance and terminated the trial contingent on the occurrence of SIB.

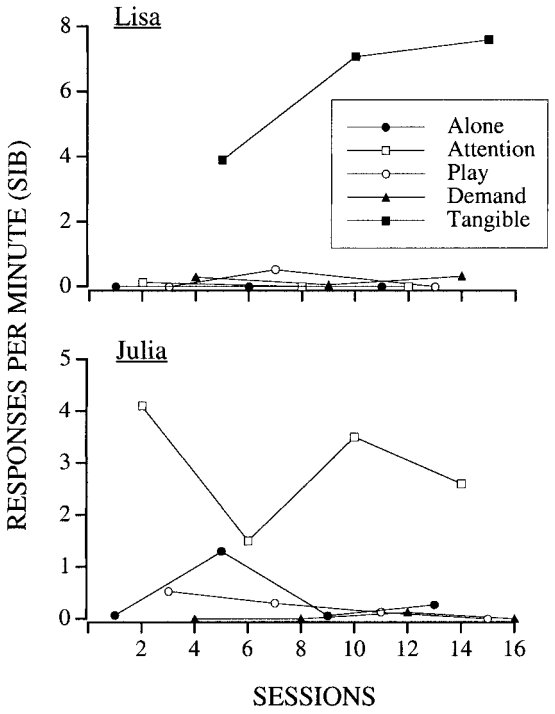

Figure 1. Responses per minute of SIB exhibited by Lisa and Julia during the functional analysis.

Alone. This condition provided a test for persistence of SIB in the absence of all social stimulation, which would be suggestive of maintenance through automatic reinforcement. The participant was alone in the room, which contained no leisure materials.

Play. This condition served as the control. The therapist and participant were in a room containing the same leisure materials that were used in the attention condition. The therapist initiated friendly social interaction (e.g., praise, handing the participant a leisure item, patting the participant on the back) at least once every 30 s (FT 30-s schedule).

Results

Figure 1 shows the results of the functional analysis for both participants, expressed as responses per minute of SIB. Lisa's rates of SIB (also see Kahng, Iwata, DeLeon, & Wallace, 2000, Figure 1) were much higher during the tangible condition than during

any other condition. Julia's SIB, although more variable than Lisa's, also occurred at higher rates during a specific test condition (attention). Thus, results of the functional analysis showed that both participants' SIB was maintained by social-positive reinforcement (access to food for Lisa; access to attention for Julia).

PHASE 2: EVALUATION OF NCR PLUS DRA

Method

To determine whether NCR might interfere with participants' acquisition of appropriate behavior under a DRA contingency, both procedures were implemented simultaneously following baseline in a multiple baseline across subjects design (Baer, Wolf, & Risley, 1968). Subsequently, the initially dense NCR schedule was thinned while the DRA schedule remained intact.

Experimental Conditions

Baseline. The baseline condition was identical to the condition of the functional analysis associated with the highest rate of SIB. Thus, Lisa received a tangible reinforcer (small pickle slices) and Julia received attention contingent on each occurrence of SIB during baseline. No contingencies were in effect for mands; observers merely recorded their occurrence during sessions.

NCR (dense) plus DRA. Under the NCR component, the maintaining reinforcer for SIB (attention for Julia, a quarter of a sliced pickle for Lisa) was delivered according to an FT schedule independent of the occurrence of SIB. The NCR schedules were based on procedures described by Kahng et al. (2000) by taking the shorter of the 2 participants' mean baseline interresponse times (IRTs) for SIB, which was calculated to be 5.35 s (Lisa), and converting it to an FT schedule (FT 5 s for practical purposes). This schedule, which remained constant throughout the condition, equaled Lisa's mean rate of reinforcement for SIB during baseline and was approximately three times denser than Julia's mean rate of reinforcement during baseline.

Mand training (DRA) was conducted in the following manner. To shape the occurrence of mands, the therapist initially delivered a verbal cue combined with a physical prompt to engage in the alternative response at 30-s intervals. Maintaining reinforcers for SIB were delivered following each occurrence of either prompted or unprompted mands. The prompting procedure was removed if unprompted mands increased above their baseline rates and was reinstated if these increases were not maintained. The criteria for removing prompts were (a) three consecutive sessions during which mands occurred at or above the highest rate observed in baseline (Lisa), and (b) one session during which mands occurred at or above the highest rate observed during baseline (Julia). A more stringent criterion was used for Lisa because her baseline rate of mands was lower than Julia's; thus, we believed that a more stringent criterion during mand training would afford Lisa more opportunities to contact the DRA contingency. The criterion for reinstating prompts was three consecutive sessions during which the rate of mands was less than the highest rate observed during baseline.

NCR (schedule thinning) plus DRA. If increases in mands were not observed during the initial NCR plus DRA condition, the NCR schedule was thinned while the DRA schedule (FR 1) remained intact. Procedures for thinning the NCR schedules were as follows and were similar to those described by Vollmer et al. (1993). Starting with the most dense NCR schedule (FT 5 s, or 12 reinforcers per minute), each reinforcer delivery was assigned a 5-s bin (i.e., the first reinforcer was delivered at the start of each min-

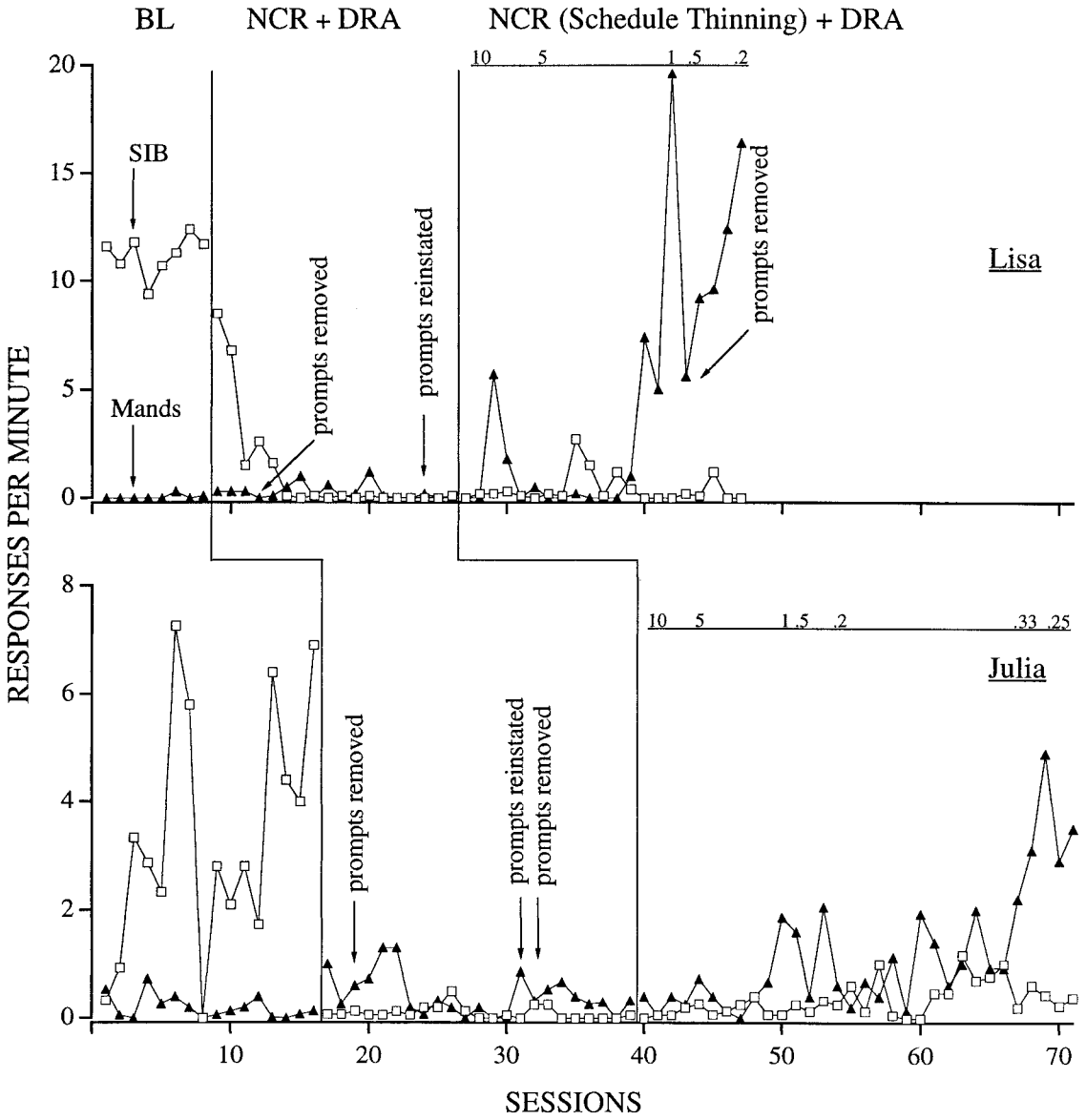

Figure 2. Responses per minute of SIB and mands exhibited by Lisa and Julia during baseline and treatment conditions. Numbers at the top of the graph during the final treatment condition refer to the NCR schedule value, expressed as number of reinforcers delivered per minute (not all values are shown).

ute, the second reinforcer was delivered at the 5-s mark, the third was delivered at the 10-s mark, etc., until the 12th and final reinforcer was delivered at the 55-s mark). NCR schedule thinning involved removing first the 12th and, subsequently, all even-numbered reinforcers during each step to produce, respectively, schedules of 11 per minute (minus the 12th reinforcer) down to six per minute (minus the second reinforcer). Odd-numbered reinforcer deliveries were then removed to produce schedules of five per minute (minus the 11th reinforcer) down to one per minute (minus the third reinforcer). When the NCR schedule reached one per minute, it was then thinned

to 0.5 per minute (FT 2 min), 0.33 per minute (FT 3 min), 0.25 per minute (FT 4 min), and 0.2 per minute (FT 5 min). Using these procedures, the NCR schedule was thinned each time that SIB occurred at or below a rate of 0.5 per minute for a session. If, at any point during schedule thinning, SIB exceeded 0.5 responses per minute for two consecutive sessions, the NCR schedule was increased to that of the previous step.

Results

Figure 2 shows the results obtained for Lisa and Julia during baseline and treatment conditions. Lisa engaged in a high rate of SIB during baseline. During NCR (dense) plus DRA, her SIB decreased rapidly and, after Session 14, never exceeded 0.1 responses per minute. During NCR (schedule thinning) plus DRA, the NCR schedule was first thinned from 12 reinforcers per minute to 11 per minute on Session 27 and eventually reached 0.2 per minute (FT 5 min), at which time formal treatment sessions were discontinued. Lisa's rate of SIB remained low throughout this condition, except for a brief increase observed during Sessions 35 to 39.

Lisa rarely engaged in independent clapping during baseline and, although prompting was removed following a slight increase in clapping during the first three sessions of NCR (dense) plus DRA, it was subsequently reinstated because Lisa's clapping decreased again to almost zero. Her rate of clapping again increased during the first few sessions of NCR (schedule thinning) plus DRA, but subsequently decreased. Consistent increases in clapping were not observed until Session 40, when the NCR schedule was thinned to a rate of two per minute, which represented a sixfold reduction in the rate of reinforcement from its initial schedule. The prompting procedure was removed on Session 43.

Julia's rate of SIB during baseline was extremely variable. During NCR (dense) plus DRA, her rate of SIB decreased immediately and never exceeded 0.5 per minute. During NCR (schedule thinning) plus DRA, Julia's rate of SIB remained low for the first half of the phase but increased slightly thereafter. The NCR schedule was first thinned on Session 40 and proceeded through Session 64, at which time her SIB exceeded 0.5 responses per minute for two consecutive sessions at an NCR schedule of 0.25 per minute. At that point, the NCR schedule was increased to 0.33 per minute before returning to 0.25 per minute (the terminal schedule) again.

Julia's waving occurred at a low rate during baseline. At the outset of NCR (dense) plus DRA, the prompting procedure was removed because her rate of waving initially exceeded its highest rate observed during baseline. Prompting was reinstated because waving decreased to below baseline rates (Sessions 28 to 30), but was removed again after only one session. By the end of NCR (dense) plus DRA, Julia's rate of waving slightly exceeded her rate of SIB but was not much higher than that observed during baseline. During NCR (schedule thinning) plus DRA, her waving first showed a noticeable increase on session 50, when the NCR schedule was one per minute, which represented a 12-fold reduction in the rate of reinforcement from its initial schedule. Julia's waving then decreased for a few sessions before finally showing a steeper increase over the final 14 sessions (Sessions 58 to 71), during which the NCR schedule fluctuated between 0.33 per minute and 0.2 per minute.

GENERAL DISCUSSION

We examined the extent to which noncontingent reinforcement, when used as treatment to decrease problem behavior, might interfere with differential reinforcement contingencies designed to strengthen alternative behavior. After identifying through a functional analysis the positive reinforcers (food, attention) that maintained

participants' SIB, we delivered those reinforcers under dense NCR schedules in which the rate of reinforcement was as great as or greater than that delivered contingent on SIB during baseline. We delivered the same reinforcers concurrently under DRA contingencies in an attempt to strengthen replacement behaviors (mands). Results showed that NCR plus DRA was associated with a decrease in SIB but little or no increase in appropriate mands. When the NCR schedule was subsequently thinned while the DRA schedule remained unchanged, SIB remained low and mands increased.

The procedures used during the NCR plus DRA conditions were similar to those used by Marcus and Vollmer (1996), with one exception. The data presented by Marcus and Vollmer for 2 participants showed some evidence of an inverse correlation between mand acquisition and rate of reinforcement under the NCR schedule. However, because the NCR schedules were thinned so quickly, this relationship was not apparent. Therefore, we continued to deliver NCR according to dense schedules for protracted periods of time (18 and 23 sessions for Lisa and Julia, respectively) before thinning was initiated. Neither participant showed noticeable evidence of mand acquisition under the DRA contingency while the dense NCR schedule remained in effect. Consistent increases in manding were observed only when the NCR schedules were reduced by a factor of six (Lisa) or 12 (Julia) from their initial values. These results clarify those reported by Marcus and Vollmer by showing that (a) dense NCR schedules may induce satiation that not only suppresses problem behavior but also interferes with the acquisition of appropriate behavior; and (b) NCR schedule thinning may attenuate this problem.

The results obtained in this study also suggest two implications for future research. First, all of the research published in recent years on the therapeutic use of NCR has involved delivery of NCR under dense schedules, at least initially. Because one limitation of NCR is that it does not necessarily strengthen any appropriate behavior, the addition of a DRA contingency at some point in the treatment process seems inevitable. However, the present data suggest that concurrent implementation of dense NCR schedules and DRA contingencies is incompatible. One potential solution to this problem was also suggested in the present data. It is possible that the most effective or efficient way to combine NCR and DRA procedures is to begin treatment using only dense NCR schedules and to add a DRA contingency after NCR schedule thinning has progressed to some extent. Another potential solution might be derived from a recent study by Fischer et al. (1997), in which it was shown that "arbitrary" reinforcers (i.e., those that were not responsible for maintaining problem behavior) may nevertheless suppress problem behavior when delivered according to NCR schedules. Based on their results, it may be possible to combine a dense NCR schedule with a DRA contingency if the two procedures involved delivery of different reinforcers (i.e., if arbitrary reinforcers were delivered noncontingently while maintaining reinforcers were delivered contingent on the occurrence of alternative behavior). However, this strategy would be effective only if satiation to an arbitrary reinforcer does not adversely affect motivation to engage in the alternative response to obtain the maintaining reinforcer. Unfortunately, the data presented by Fischer et al. seemed to suggest that the delivery of arbitrary reinforcers may reduce motivation to produce the maintaining reinforcer. Thus, future research is needed to examine these and other ways to combine NCR and DRA procedures.

A second implication suggested by the present results is that NCR schedules may pro-

duce decreases in a target response through different behavioral processes, a possibility that has been noted by others (e.g., Lalli et al., 1997; Vollmer et al., 1993). Because our participants did not acquire the alternative behaviors under the DRA contingency during the dense NCR condition, it is likely that the establishing operation (EO; Michael, 1982) for engaging in the alternative behavior (deprivation from the maintaining reinforcer) was reduced or eliminated. This same account would appear to be a reasonable explanation for observed decreases in SIB under the dense NCR schedules. However, if thinning the NCR schedule reinstated an EO for the alternative behavior and accounted for increased manding under the DRA contingency, it should also have reinstated the EO for SIB; instead, SIB remained low during the NCR thinning condition. These results lend some support to the suggestion that response suppression under dense NCR schedules results from elimination of an EO, whereas suppression under thin NCR schedules results from extinction. Additional (although indirect) support for this suggestion can be seen in the increases observed in both participants' SIB during NCR schedule thinning, which may have represented extinction bursts and may have marked the transition point to extinction. If, in fact, behavior can be extinguished under thin NCR schedules, then the effects of such schedules may be largely artifactual; additional research is needed to clarify this issue.

The study also contains some limitations, the first of which is a practical one. The terminal schedules (FT 5 min for NCR and FR 1 for DRA) could be impractical to implement by caregivers under natural conditions. It is unknown if SIB would reemerge or if alternative behaviors would be maintained should caregivers fail to deliver reinforcement according to the terminal schedules used in this study, although Marcus and Vollmer (1996) showed maintenance of therapeutic effects under an intermittent DRA contingency. Future research should include a systematic evaluation of thinner FT and intermittent DRA schedules both singly and in various combinations. A related practical limitation concerns the absence of data on staff training. Although therapists who were responsible for the daily treatment of participants in this study were eventually taught how to implement the procedures, we did not collect reliable data on their performance. Future research should address the problem of procedural drift by developing methods to both establish and maintain high levels of treatment integrity (e.g, see Shore, Iwata, Vollmer, Lerman, & Zarcone, 1995, as an example).

A second limitation is that the effectiveness of the DRA contingency combined with thin NCR schedules was demonstrated only for brief periods of time. For example, even thin NCR schedules may induce satiation when implemented throughout the day, which may produce the same type of interference with differential reinforcement programs as that observed when dense schedules of NCR were delivered over short periods of time in this study.

A third limitation is a procedural one, in that response suppression observed even under the dense NCR schedules may have resulted from extinction because SIB no longer produced access to its maintaining reinforcer. This limitation has been characteristic of almost all research on therapeutic uses of NCR, most likely because continued reinforcement of problem behavior during treatment would not usually be recommended. However, results obtained in two studies have shown that dense schedules of NCR can reduce behavior even though occurrences of the behavior continue to be reinforced (Fischer et al., 1997; Lalli et al., 1996).

Finally, the use of a reversal design, in which the interfering effects of rich NCR schedules are replicated on a within-subject basis, would have afforded a greater degree

of experimental control. This is especially true in light of the delayed increases observed in mands during treatment. However, because we were primarily interested in the initial rate of mand acquisition, and not subsequent increases or decreases (i.e., maintenance), a multiple baseline design seemed appropriate.

In spite of these limitations, the basic findings of the study offer useful information to clinicians by revealing interactions between NCR and DRA that may be both detrimental and beneficial when combining the two procedures. In addition, the findings add to a small body of research on the underlying mechanisms of NCR and suggest several lines for future investigation.

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STUDY QUESTIONS

1. Describe two potential problems that might arise during the course of implementing NCR interventions.

2. Summarize the findings of the Marcus and Vollmer (1996) study. What aspect of their procedures may have increased the likelihood of obtaining those results?

3. What procedures were used during the initial NCR (dense) plus DRA condition?

4. Briefly describe the process by which the NCR schedule was thinned.

5. Summarize the treatment results with respect to SIB and manding.

6. The authors set the initial NCR schedule at FT 5 s for both participants, which equaled Lisa's mean reinforcement rate for SIB during baseline and was three times more dense than Julia's mean reinforcement rate for SIB during baseline. How might this NCR schedule have affected levels of SIB during the first part of the NCR (dense) plus DRA condition?

7. What evidence suggested that dense schedules of NCR reduce behavior through satiation, whereas thin schedules reduce behavior through extinction?

8. The authors indicated that the degree of experimental control shown in the study was less than desirable. To which set of data did their comment apply, and what was the nature of the problem?

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